Willow Dam

Site Description

Location

Water designation number (WDN)	03-0010-00
Legal description	T126N-R64W-Sec. 19,30 T126NR65W-Sec. 24,25,26
County (ies)	Brown
Location from nearest town	4 miles north and 4 ½ miles west of Westport, SD.

Survey Dates and Sampling Information

Dates of current survey	July 22-23, 2008 (FN,GN)
Date of most recent survey	May 13-14, 2003
Gill net sets (n)	4
Frame net sets (n)	12

Morphometry (Figure 1)

Watershed area (acres)	unknown
Surface area (acres)	≈275
Maximum depth (ft)	≈20
Mean depth (ft)	unknown

Ownership and Public Access

Willow Dam is owned by the City of Aberdeen and SDGFP manages the fishery. A concrete boat ramp is located on the north shore; however, no landing dock is present (Figure 1). Lands adjacent to Willow Dam are primarily managed by SDGFP as a Game Production Area (GPA) which provides public access to much of the shoreline.

Watershed and Land Use

Land-use within the Willow Dam watershed is primarily agricultural.

Water Level Observations

Willow Dam has a spillway elevation of 1,377.2 fmsl. On May 1, 2008 the elevation of Willow Dam was 1,369.7 fmsl and had increased to 1,375.4 fmsl by October 8, 2008 (Janel Ellingson, Aberdeen Water Works, pers. comm.).

Aquatic Vegetation and Exotics

Emergent vegetation was present primarily in the west arm of Willow Dam; while little submersed vegetation was reported during the 2008 fish community assessment survey. Common carp has been the only exotic species reported in Willow Dam.

Fish Management Information

Species	black bullhead, black crappie, common carp, northern pike, shorthead redhorse, walleye, white sucker, yellow perch
Lake-Specific regulations	NE Panfish Management Area: 10 daily; 50 possession No motor boats or motor vehicles
Management classification	warm-water semi-permanent
Fish Consumption Advisories	none

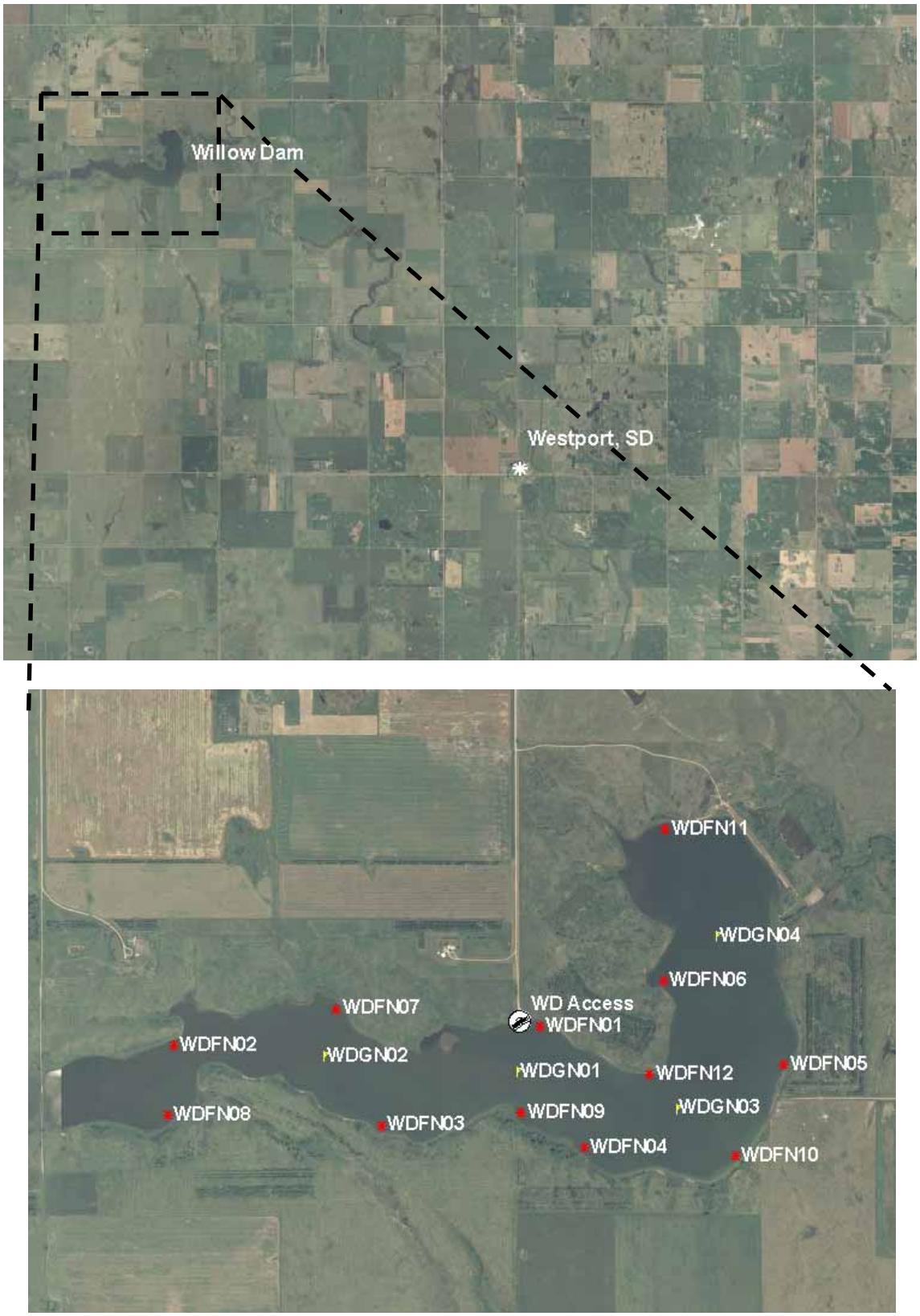

Figure 1. Map depicting location of Willow Dam from Westport, South Dakota (top). Also, noted is the boat ramp and standardized net locations for Willow Dam. WDFN= frame nets, WDGN= gill nets

Results and Discussion

Willow Dam is a 275-acre impoundment of Willow Creek in Brown County, South Dakota. Willow Dam was constructed in 1934 and serves as a municipal water source for the city of Aberdeen. As a result, water levels in Willow Dam are dependent on water usage by the city of Aberdeen. In recent years, higher water volume coming down from North Dakota via the Maple River and to a lesser extent the Elm River has minimized water usage from Willow Dam (Janel Ellingson, Aberdeen Water Works, pers. comm.) resulting in stable water levels.

Species

Walleye: The mean gill net CPUE of stock-length walleye in 2008 was 5.3, and indicative of moderate-low abundance (Table 1). The 2008 CPUE was similar to 6.0 observed in the 2003 survey (Table 2-3). Five year classes were present in the gill net sample but no pre-2002 cohorts were sampled (Table 6). Walleye stocking has not occurred in Willow Dam since 2001 indicating that the population is currently sustained by natural reproduction.

Walleye captured in gill nets during 2008 ranged in total length from 20 to 58 cm (7.9 to 22.8 inches; Figure 5). Walleye growth in Willow Dam was good with weighted mean length at capture of age-3 walleye being 429 mm (16.9 inches; Table 4). Condition of gill net captured walleye in 2008 was good with the mean Wr of stock-length walleye being 93 (Table 1). No length related trends in Wr were observed.

Northern pike: Mean gill net CPUE in 2008 of stock-length northern pike in Willow Dam was 0.8 (Tables 1-3). The 2008 gill net CPUE was substantially lower than the 7.8 observed in 2003; however, sampling occurred approximately two months later in 2008. Northern pike typically are not sampled effectively using standard lake survey methods; therefore reported values may not represent the at-large population. Neumann and Willis (1995) reported the most reliable time to sample northern pike in eastern South Dakota natural lakes with gill nets was late spring following the spawn. The 2003 survey was conducted in late spring which may partially explain the substantial difference in CPUE observed in the past two surveys.

Yellow Perch: The mean gill net CPUE of stock-length yellow perch in 2008 was 0.8 in Willow Dam (Tables 1-3). No yellow perch were sampled in 2003 (Table 2). Relative abundance is low indicating yellow perch will likely have a minimal impact on the Willow Dam fishery until recruitment improves.

Black bullhead: The mean frame net CPUE of stock-length black bullhead during 2008 was 35.9 (Tables 1-3). The 2008 mean frame net CPUE was substantially lower than the 2,023.3 observed in 2003 (Tables 2-3). The decrease in relative abundance can likely be attributed to the cyclical nature of black bullhead populations in northeast South Dakota.

Black Crappie: The mean frame net CPUE in Willow Dam for black crappie in 2008 was 2.7 (Tables 1-3). No black crappies were sampled in 2003 (Tables 2-3). Relative abundance is low indicating black crappie will likely have a minimal impact on the Willow Dam fishery until recruitment improves.

Other: Common carp, shorthead redhorse, and white sucker were other fish species captured during the 2008 survey; however, the relative abundance of these species appears to be low, and their impact on the fishery is likely minimal at this time.

Management Recommendations

1) Conduct fish community assessment surveys utilizing gill nets and frame nets every fifth year (next scheduled for summer 2013) to monitor fish relative abundance, fish population size structures, fish growth, and stocking success.

2) Collect otoliths from walleye and yellow perch to assess the age structure and growth rates of each population.

3) Encourage commercial harvest of black bullhead to limit abundance if survey results indicate high abundance.

4) Monitor water levels and winter/summerkill events. In cases of complete winter/summerkill the need to re-establish a fishery in Willow Dam should be evaluated. If so desired, northern pike, walleye, and yellow perch should be stocked to re-establish a fish community.

5) If water regime favors draw downs discontinue fish management.

Table 1. Mean catch rate (CPUE; gill/frame nets = catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and mean relative weight (Wr) of stock-length fish, for various fish species captured in experimental gill nets and frame nets in Willow Dam, 2008. Confidence intervals include 80 percent (± CI-80) or 90 percent (± CI-90). BLB= black bullhead; BLC= black crappie; COC= common carp; NOP= northern pike; SHR= shorthead redhorse; WAE= walleye; WHS= white sucker; YEP= yellow perch

	Abundance		Stock Density Indices				Condition	
Species	CPUE	CI-80	PSD	CI-90	PSD-P	CI-90	Wr	CI-90
Frame nets								
BLB	35.9	35.3	54	4	4	1	83	2
BLC	2.7	0.8	38	14	3	5	109	1
COC	3.2	0.9	89	9	37	13	89	1
NOP	1.3	0.7	75	20	13	14	93	15
SHR	0.6	0.6	100	0	100	0	110	5
WAE	0.9	0.4	100	0	64	27	85	3
WHS	0.8	0.5	100	0	100	0	100	2
YEP	0.1	0.1	100	---	0	---	97	---
Gill nets								
BLB	37.3	25.0	17	5	0	---	92	< 1
BLC	0.3	0.4	100	---	0	---	120	---
COC	7.0	5.8	93	7	4	6	91	1
NOP	0.8	1.2	100	0	67	33	100	24
SHR	1.8	1.6	100	0	100	0	111	4
WAE	5.3	3.3	62	19	14	14	93	2
WHS	1.8	1.8	100	0	100	0	104	6
YEP	0.8	0.4	100	0	0	---	104	20

Table 2. Historic mean catch rate (CPUE; gill/frame nets = catch/net night) of stock-length fish for various fish species captured in experimental gill nets and frame nets in Willow Dam, 2003-2008. BLB= black bullhead; BLC= black crappie; COC= common carp; NOP= northern pike; SHR= shorthead redhorse; WAE= walleye; WHS= white sucker; YEP= yellow perch

	CPUE						
Species	2003	2004	2005	2006	2007	2008[1]	Mean
Frame nets							
BLB	2023.3	---	---	---	---	35.9	1029.6
BLC	0.0	---	---	---	---	2.7	1.4
COC	0.9	---	---	---	---	3.2	2.1
NOP	2.3	---	---	---	---	1.3	1.8
SHR	0.0	---	---	---	---	0.6	0.3
WAE	1.5	---	---	---	---	0.9	1.2
WHS	3.6	---	---	---	---	0.8	2.2
YEP	0.0	---	---	---	---	0.1	0.1
Gill nets							
BLB	76.3	---	---	---	---	37.3	56.8
BLC	0.0	---	---	---	---	0.3	0.2
COC	2.8	---	---	---	---	7.0	4.9
NOP	7.8	---	---	---	---	0.8	4.3
SHR	0.0	---	---	---	---	1.8	0.9
WAE	6.0	---	---	---	---	5.3	5.7
WHS	7.3	---	---	---	---	1.8	4.6
YEP	0.0	---	---	---	---	0.8	0.4

[1] Sampling conducted approximately two-months later in 2008 (mid-July).

Table 3. Mean catch rate (CPUE; gill/frame nets = catch/net night) of stock-length fish, proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish, and relative weight (Wr) for selected species captured in experimental gill nets and frame nets in Willow Dam, 2003-2008. BLB= black bullhead; BLC= black crappie; NOP= northern pike; WAE= walleye

Species	2003	2004	2005	2006	2007	2008[1]	Average
Frame nets							
BLB							
CPUE	2023	---	---	---	---	36	1030
PSD	3	---	---	---	---	54	29
PSD-P	0	---	---	---	---	4	2
Wr	---	---	---	---	---	83	83
BLC							
CPUE	0	---	---	---	---	3	2
PSD	---	---	---	---	---	38	38
PSD-P	---	---	---	---	---	3	3
Wr	---	---	---	---	---	109	109
Gill nets							
NOP							
CPUE	8	---	---	---	---	1	5
PSD	90	---	---	---	---	100	95
PSD-P	10	---	---	---	---	67	39
Wr	94	---	---	---	---	100	97
WAE							
CPUE	6	---	---	---	---	5	6
PSD	4	---	---	---	---	62	33
PSD-P	0	---	---	---	---	14	7
Wr	96	---	---	---	---	93	95

[1] Sampling conducted approximately two-months later in 2008 (mid-July).

Table 4. Weighted mean length at capture (mm) for walleye captured in experimental gill nets in Willow Dam, 2003-2008. Note: sampling was conducted two-months later in 2008 (mid-July).

		Age						
Year	N	1	2	3	4	5	6	7
2008[1]	23	242	368	429	---	---	577	520
2003	24	---	311	433	---	---	---	---

[1]Age assignments made using otoliths; scales were used in previous years.

Table 5. Stocking history including size and number for fishes stocked into Willow Dam, 2000-2008.

Year	Species	Size	Number
2000	WAE	small fingerling	70,300
2001	LMB	fingerling	900
2001	WAE	fry	150,000

Table 6. Numbers of walleye sampled using gill nets (n) by year class and associated stocking history (Number stocked x 1,000) for walleye captured in Willow Dam, 2003-2008.

	Year Class								
Survey Year	2008	2007	2006	2005	2004	2003	2002	2001	2000
2008[1]		5	8	4		1	5		
2003	---	---	---	---	---			23	1
Number stocked									
fry								150	
small fingerling									70
large fingerling									

[1]Age assignments made using otoliths; scales were used in previous years.

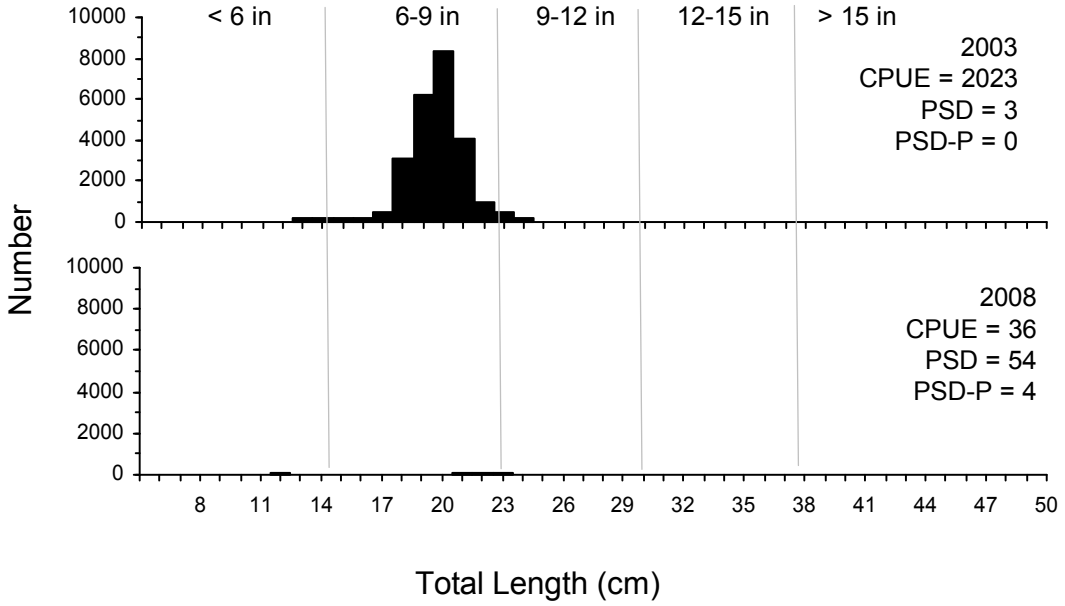

Figure 2. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P fish for black bullhead captured by frame nets in Willow Dam, 2003 and 2008.

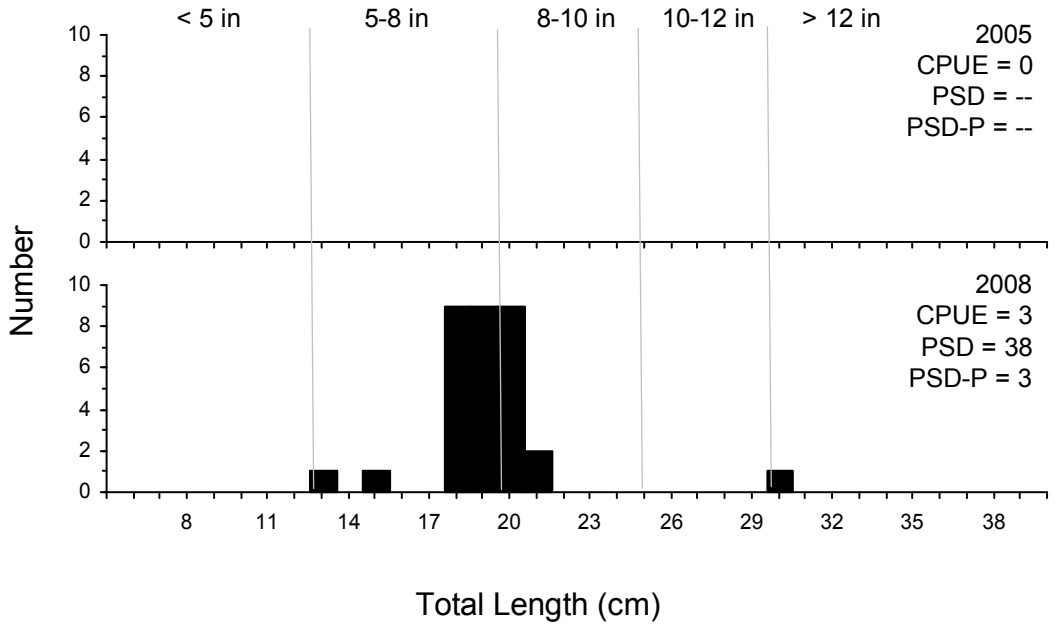

Figure 3. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for black crappie captured by frame nets in Willow Dam, 2003 and 2008.

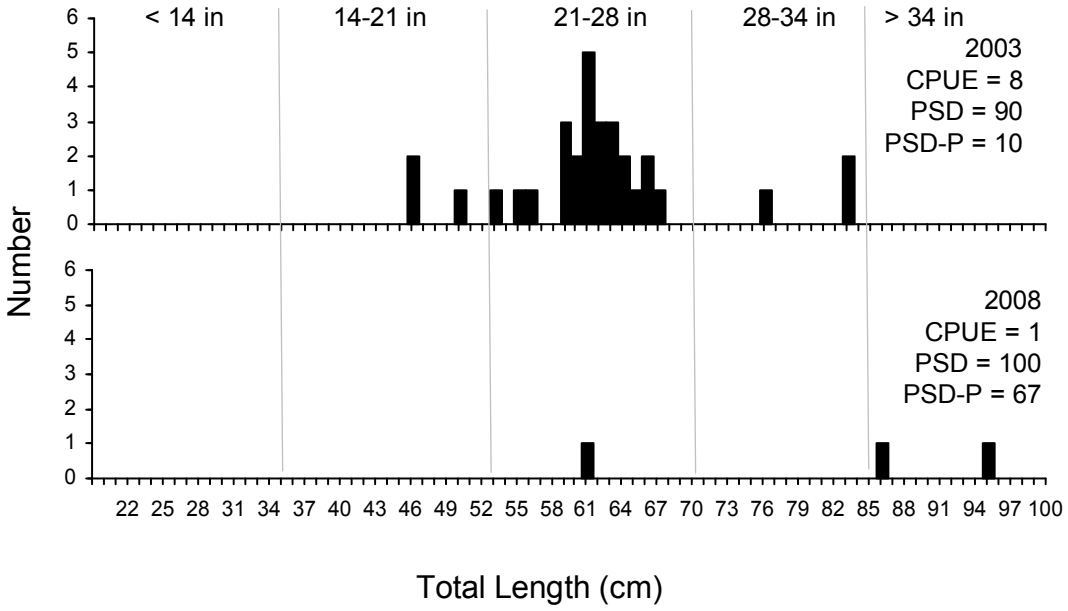

Figure 4. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P fish for northern pike captured by gill nets in Willow Dam, 2003 and 2008.

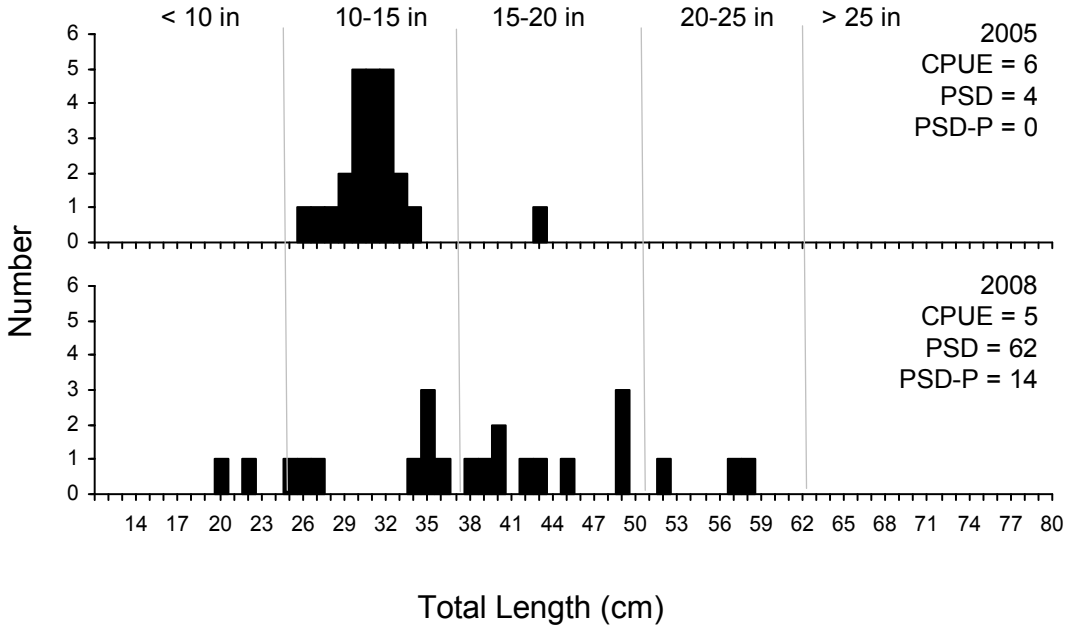

Figure 5. Length-frequency histogram, catch rate of stock-length fish (CPUE), proportional size distribution of quality- (PSD) and preferred-length (PSD-P) fish for walleye captured by gill nets in Willow Dam, 2003 and 2008.